Labiatæ, Teucrium for instance, it is scarcely perceptible, but there are exceptional cases.

I would like to show that the characteristic element in the Cruciferæ has an opposite or thirst-exciting effect, and to point out the effects of citric, amygdaline, malic, nutty and other odors, but enough has been said to illustrate my meaning.

BRIEFER ARTICLES.

A Study of Silphium perfoliatum and Dipsacus laciniatus in regard to insects.[1]—The upper surface of the leaf of Silphium perfoliatum near the axis is thickly set with small hairs. Their length is on the average about .17 mm. They are composed of four cells each having a distinct nucleus; the upper one is somewhat enlarged. Some of the hairs are colorless, while in some a peculiar brown substance was seen which was variously distributed, sometimes in masses at the top of the upper cell or diffused through the upper cell, and sometimes through the lower ones as well. These hairs point toward the tip of the leaf. Similar hairs were found all along the mid vein, side veins and veinlets of the upper surface of the leaf, and also on similar portions of the under surface. No difference was seen between these hairs and those near the axis, except that they were much more thickly set along a surface about an inch in length at the base of the leaf. The leaf examined was about 20 cm. long and was typical.

The brown material does not seem peculiar to the hairs. Upon the upper surface of the leaves were found some more very small prickles composed of two cells, the upper very pointed, the lower one globular and containing an onion-shaped mass of brown matter similar in appearance to that in the hairs. In the epidermal cells of the stalk were found similar masses, and some cells were completely filled with it.

The cavities formed by the perfoliate leaves are very small and hold but a few cubic centimeters of water. They are full after any rain or heavy dew, but are often dry before noon. If cups are dry at night they will be filled in the morning when there is a heavy dew; otherwise they will be dry.

These cups do not appear to serve any purpose as insect catchers. No insects were seen in any of the cups. This plant is not native here,[2] and perhaps it does not show its full development with us.

Is Dipsacus laciniatus insectivorous? To answer this question was the purpose of the following observations:

It is well known the connate leaves of this plant form cups sur-

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[1] Read at meeting of A. A. A. S., New York, August, 1887.

[2] Lansing, Michigan.

rounding the stalks, which most of the time contain more or less water. It has been suggested that the purpose of this arrangement is to catch insects for the nutrition of the plant.

A microscopical examination of the leaf surface was made, to discover, if possible, any peculiar organs of absorption. Especially was that portion of the leaf explored that is much of the time beneath the water in the cups. On this portion of the leaf were found two forms of hairs. The more numerous were about .09 mm. long, with a club shaped upper portion upon a pedicel composed of a single cell. The upper part was composed of about five nucleated cells; it was broader than thick, and seemed to be divided by a partition across the narrow way. These hairs were all inclined toward the tip of the leaf with the broad side toward the leaf surface, and were not very numerous. The rarer form of hairs had a rounded head upon a pedicel of a single cell. The head was divided into a number of cells which contained no visible nuclei, but were generally filled with brownish-green masses of granular matter.

Other portions of the leaf were also examined, and upon the whole upper surface along the mid vein, side veins and veinlets, were found hairs similar in form to these and equally numerous. They were also found on the corresponding portions of the under surface of the leaf. So far as *special* organs of absorption are concerned, that part of the leaf below the surface of the water shows no advantage over any other part.

Twenty plants were watched carefully for two weeks, and during that time but few insects were caught, and those were mainly bees; the nutrition from the insects caught could be but little.

Water was gathered from several plants ten days after a rain, when it had evaporated largely and must have been concentrated. The water was filtered from suspended matter, mainly algæ and flower petals, and the starch-iodine test applied, first for nitrites and then for nitrates, and no indication was obtained of the presence of either. If present at all, they were in extremely small amounts. Nessler's test for ammonia gave a marked reaction, showing the presence of from one to two parts of ammonia in 1,000,000. To take advantage of so small an amount of ammonia hardly seems sufficient cause for such a modification of the leaves, with no *special* organs for absorption. It would seem that the plant might get some good from the ammonia in the water, and perhaps these hairs may absorb the nitrogen compounds from air or water. But this supposition would include all similar hairs on both surfaces of the leaves, and would not account for the cups; it can only be an incidental advantage, therefore, and not the prime use of the water-gathering cups.

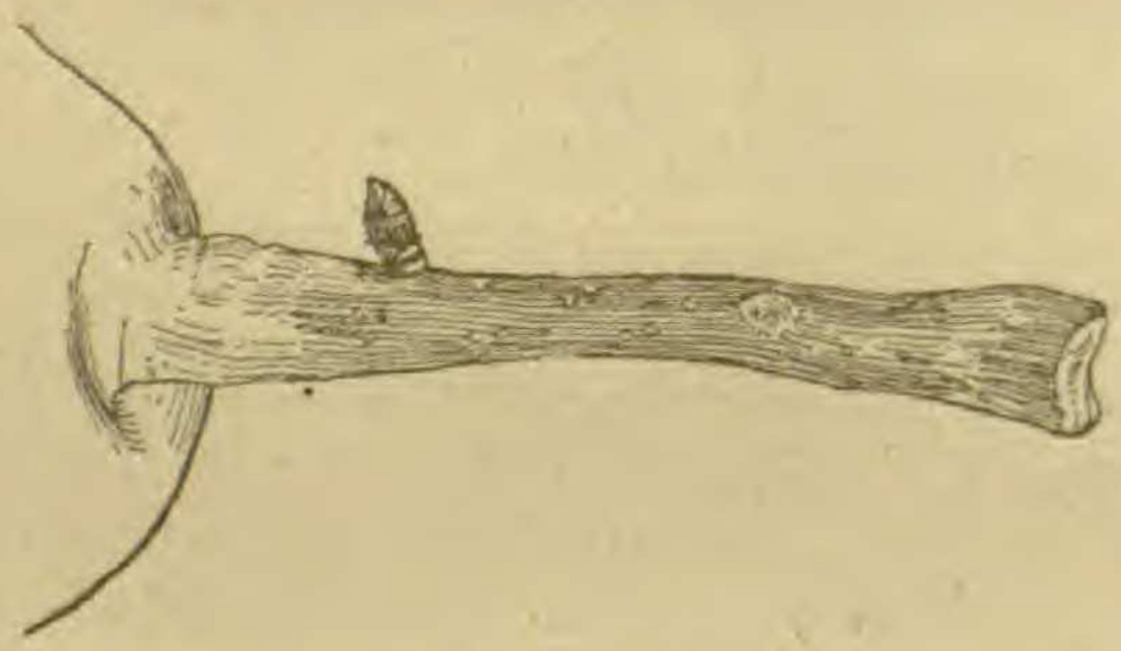
Dipsacus depends mainly on the rain for its water supply, and very little upon the dew. Some cups were thoroughly emptied, and it was found that after a heavy dew there would be a little water in the cups. This would tend to replace that lost by evaporation, but this loss is slight

because the water is so well shaded from the sun. Upon July 20, there was a copious rain that filled all the cups, and it was five days before any marked diminution of the water was noticed. At the end of fourteen days many of the lower cups still contained water. The cups were found to contain from 300 to 600 cc. An average plant would hold about a liter, and a large plant as much as a liter and a half.

It seems more probable that the object of the cups with their water is to protect the plant from crawling insects, which it does most effectually. The blossoms are frequented by bees and other flying insects, but upon the plants are found no ants or other crawling animals. The hooked prickles so thickly set along the stems, and especially on the stem just beneath the blossoms, are a perfect barrier against snails, slugs and such soft-bodied animals, while the water keeps away the hard-bodied insects. The flowers are not well arranged for cross-fertilization by ants, as the anthers and stigmas are raised so far above the throat of the corolla that ants would not reach them easily and naturally.

It is doubtless to the advantage of the plant that such insects be kept away, as they would take the nectar and yield nothing in return.

It is perhaps worthy of notice that no bridge is thrown across this moat until the falling flowers cover the surface, and then it is too late for them to be injured by marauding ants.—W. J. Beal and C. E. St. John.



Bud on a pear stem.—The Howell pear often presents a curious anomaly in bearing a well-developed bud upon its fruit stem. The accompanying cut shows such a bud borne a half inch below the base of the fruit. This singular disposition is additional proof, if any were needed, that the fruit stalk is essentially a true stem, bearing a transformed cluster of leaves.—L. H. Bailey, Jr., *Agricultural College, Mich.*

Cultivation of saccharomycetes.—Some fermentation experiments with which I was engaged during the past summer required the application of pure yeast, free from other organisms capable of producing fermentation. The methods of separation and cultivation employed were very successful, and may suggest something of value here.

A few drops of fresh beer-yeast were shaken in a test tube with sterilized gelatine, which had been melted and cooled again until it was barely fluid. This, flowed upon sterilized plates, gave in twenty-four hours, at ordinary room temperature, a great number of colonies of schizomycetes and saccharomycetes, from which, with the aid of an ordi-